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UTILITY PATENT APPLICATION TRANSMITTAL

(Only for new nonprovisional applications under 37 C.F.R. § 1.53(b))

Attorney Docket No.	24149-11
First Inventor or Application Identifier	Eilaz Babaev
Title	NOZZLE FOR ULTRASOUND WOUND TREATMEN
Express Mail Label No.	EL432143412US

APPLICATION ELEMENTS

See MPEP chapter 600 concerning utility patent application contents.

ADDRESS TO: **Assistant Commissioner for Patents, Box Patent Application, Washington, DC 20231**

1. [X] * Fee Transmittal Form *(e.g., PTO/SB/17)* *(Submit an original and a duplicate for fee processing)*
2. [X] Specification [*Total Pages* 15]
   (preferred arrangement set forth below)
   - Descriptive title of the Invention
   - Cross References to Related Applications
   - Statement Regarding Fed sponsored R & D
   - Reference to Microfiche Appendix
   - Background of the Invention
   - Brief Summary of the Invention
   - Brief Description of the Drawings *(if filed)*
   - Detailed Description
   - Claim(s)
   - Abstract of the Disclosure
3. [X] Drawing(s) *(35 U.S.C. 113)* [*Total Sheets* 10]
4. Oath or Declaration UNexecuted [*Total Pages* 2]
   a. [X] Newly executed (original or copy)
   b. [ ] Copy from a prior application (37 C.F.R. § 1.63(d)) *(for continuation/divisional with Box 16 completed)*
      i. [ ] DELETION OF INVENTOR(S) Signed statement attached deleting inventor(s) named in the prior application, see 37 C.F.R. §§ 1.63(d)(2) and 1.33(b).

** NOTE FOR ITEMS 1 & 13: IN ORDER TO BE ENTITLED TO PAY SMALL ENTITY FEES, A SMALL ENTITY STATEMENT IS REQUIRED (37 C.F.R. § 1.27), EXCEPT IF ONE FILED IN A PRIOR APPLICATION IS RELIED UPON (37 C.F.R. § 1.28).*

5. [ ] Microfiche Computer Program *(Appendix)*
6. Nucleotide and/or Amino Acid Sequence Submission *(if applicable, all necessary)*
   a. [ ] Computer Readable Copy
   b. [ ] Paper Copy (identical to computer copy)
   c. [ ] Statement verifying identity of above copies

ACCOMPANYING APPLICATION PARTS

7. [ ] Assignment Papers (cover sheet & document(s))
8. [ ] 37 C.F.R.§3.73(b) Statement *(when there is an assignee)* [ ] Power of Attorney
9. [ ] English Translation Document *(if applicable)*
10. [ ] Information Disclosure Statement (IDS)/PTO-1449 [ ] Copies of IDS Citations
11. [ ] Preliminary Amendment
12. [ ] Return Receipt Postcard (MPEP 503) *(Should be specifically itemized)*
13. [X] * Small Entity Statement(s) *(PTO/SB/09-12)* [ ] Statement filed in prior application, Status still proper and desired
14. [ ] Certified Copy of Priority Document(s) *(if foreign priority is claimed)*
15. [ ] Other: .....

16. **If a CONTINUING APPLICATION,** *check appropriate box, and supply the requisite information below and in a preliminary amendment:*
    [ ] Continuation [ ] Divisional [ ] Continuation-in-part (CIP) of prior application No: _____/_____
    Prior application information: *Examiner* _____ *Group / Art Unit:* _____
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[ ] *Customer Number or Bar Code Label* *(Insert Customer No. or Attach bar code label here)* or [X] *Correspondence address below*

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Name (Print/Type)	R. Lewis Gable	*Registration No. (Attorney/Agent)*	22,479
Signature		*Date*	Oct. 6, 2000

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TOTAL AMOUNT OF PAYMENT ($) 562.00

Complete if Known	
Application Number	
Filing Date	
First Named Inventor	Eilas Babaev
Examiner Name	
Group / Art Unit	
Attorney Docket No.	24149-11

METHOD OF PAYMENT (check one)

1. ☑ The Commissioner is hereby authorized to charge indicated fees and credit any overpayments to.

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Deposit Account Name: Cowan, Liebowitz & Latman

☑ Charge Any Additional Fee Required Under 37 CFR §§ 1.16 and 1.17

2. ☑ **Payment Enclosed:** ☑ Check ☐ Money Order ☐ Other

FEE CALCULATION

1. BASIC FILING FEE

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description	Fee Paid
101	690	201	345	Utility filing fee	355.00
106	310	206	155	Design filing fee	
107	480	207	240	Plant filing fee	
108	690	208	345	Reissue filing fee	
114	150	214	75	Provisional filing fee	

SUBTOTAL (1) ($) 355.00

2. EXTRA CLAIM FEES

	Extra Claims		Fee from below	Fee Paid
Total Claims 43	-20** = 23	X	9.00	= 207.
Independent Claims 1	- 3** = 0	X		= 0
Multiple Dependent				= 0

***or number previously paid, if greater; For Reissues, see below*

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description
103	18	203	9	Claims in excess of 20
102	78	202	39	Independent claims in excess of 3
104	260	204	130	Multiple dependent claim, if not paid
109	78	209	39	** Reissue independent claims over original patent
110	18	210	9	** Reissue claims in excess of 20 and over original patent

SUBTOTAL (2) ($) 562.00

FEE CALCULATION (continued)

3. ADDITIONAL FEES

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description	Fee Paid
105	130	205	65	Surcharge - late filing fee or oath	
127	50	227	25	Surcharge - late provisional filing fee or cover sheet.	
139	130	139	130	Non-English specification	
147	2,520	147	2,520	For filing a request for reexamination	
112	920*	112	920*	Requesting publication of SIR prior to Examiner action	
113	1,840*	113	1,840*	Requesting publication of SIR after Examiner action	
115	110	215	55	Extension for reply within first month	
116	380	216	190	Extension for reply within second month	
117	870	217	435	Extension for reply within third month	
118	1,360	218	680	Extension for reply within fourth month	
128	1,850	228	925	Extension for reply within fifth month	
119	300	219	150	Notice of Appeal	
120	300	220	150	Filing a brief in support of an appeal	
121	260	221	130	Request for oral hearing	
138	1,510	138	1,510	Petition to institute a public use proceeding	
140	110	240	55	Petition to revive - unavoidable	
141	1,210	241	605	Petition to revive - unintentional	
142	1,210	242	605	Utility issue fee (or reissue)	
143	430	243	215	Design issue fee	
144	580	244	290	Plant issue fee	
122	130	122	130	Petitions to the Commissioner	
123	50	123	50	Petitions related to provisional applications	
126	240	126	240	Submission of Information Disclosure Stmt	
581	40	581	40	Recording each patent assignment per property (times number of properties)	
146	690	246	345	Filing a submission after final rejection (37 CFR § 1.129(a))	
149	690	249	345	For each additional invention to be examined (37 CFR § 1.129(b))	

Other fee (specify) _____

Other fee (specify) _____

*Reduced by Basic Filing Fee Paid **SUBTOTAL (3)** ($)

SUBMITTED BY				Complete (if applicable)	
Name (Print/Type)	R. Lewis Gable	Registration No. (Attorney/Agent)	22,479	Telephone	212-790-9200
Signature				Date	October 6, 2000

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Name of Person Mailing

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STATEMENT CLAIMING SMALL ENTITY STATUS (37 CFR 1.9(f) & 1.27(c))--SMALL BUSINESS CONCERN	Docket Number (Optional) 24149-11

Applicant, Patentee, or Identifier: Eilaz Babaev
Application or Patent No.:
Filed or Issued:
Title: NOZZLE FOR ULTRASOUND WOUND TREATMENT

I hereby state that I am
☐ the owner of the small business concern identified below:
☒ an official of the small business concern empowered to act on behalf of the concern identified below:

NAME OF SMALL BUSINESS CONCERN Advanced Medical Applications

ADDRESS OF SMALL BUSINESS CONCERN 6570 Edenvale Blvd., Eden Prairie, MN 55346

I hereby state that the above identified small business concern qualifies as a small business concern as defined in 13 CFR Part 121 for purposes of paying reduced fees to the United States Patent and Trademark Office. Questions related to size standards for a small business concern may be directed to: Small Business Administration, Size Standards Staff, 409 Third Street, SW, Washington, DC 20416.

I hereby state that rights under contract or law have been conveyed to and remain with the small business concern identified above with regard to the invention described in:

☒ the specification filed herewith with title as listed above.
☐ the application identified above.
☐ the patent identified above.

If the rights held by the above identified small business concern are not exclusive, each individual, concern, or organization having rights in the invention must file separate statements as to their status as small entities, and no rights to the invention are held by any person, other than the inventor, who would not qualify as an independent inventor under 37 CFR 1.9(c) if that person made the invention, or by any concern which would not qualify as a small business concern under 37 CFR 1.9(d), or a nonprofit organization under 37 CFR 1.9(e).

Each person, concern, or organization having any rights in the invention is listed below:
☒ no such person, concern, or organization exists.
☐ each such person, concern, or organization is listed below.

Separate statements are required from each named person, concern or organization having rights to the invention stating their status as small entities. (37 CFR 1.27)

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NAME OF PERSON SIGNING Gene Berghoff

TITLE OF PERSON IF OTHER THAN OWNER President

ADDRESS OF PERSON SIGNING 6570 Edenvale Blvd., Eden Prairie, MN 55346

SIGNATURE Gene M Berghoff DATE 10-6-, 2000

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NOZZLE FOR ULTRASOUND WOUND TREATMENT

FIELD OF THE INVENTION

The present invention relates to a device for using ultrasonic waves in wound treatment. More particularly, the present invention relates to a device for spraying a wound surface using ultrasonic waves for delivering drugs, killing bacteria, cleansing a surface, and stimulating healthy tissue cells.

BACKGROUND OF THE INVENTION

Ultrasonic waves have been widely used in medical applications, including both diagnostics and therapy as well as in many industrial applications. One diagnostic use of ultrasound waves includes using ultrasonic waves to detect underlying structures in an object or a human tissue. In this procedure, an ultrasonic transducer is placed in contact with the object or tissue via a coupling medium and high frequency (1-10 MHz) ultrasonic waves are directed into the tissue. Upon contact with the various underlying structures, the waves are reflected back to a receiver adjacent to the transducer. By comparison of the signals of the ultrasonic wave as sent with the reflected ultrasonic wave as received, an image of the underlying structure can be produced. This technique is particularly useful for identifying boundaries between components of tissue and can be used to detect irregular masses, tumors and the like.

Two therapeutic medical uses of ultrasound waves include aerosol mist production and contact physiotherapy. Aerosol mist production makes use of a nebulizer or inhaler to produce an aerosol mist for creating a humid environment and delivering drugs to the lungs. Ultrasonic nebulizers operate by the passage of ultrasound waves of sufficient intensity through a liquid, the waves being directed at an air-liquid interface of the liquid from a point underneath or within the liquid. Liquid particles are ejected from the surface of the liquid into the surrounding air following the disintegration of capillary waves produced by the ultrasound. This technique can produce a very fine dense fog or mist. Aerosol mists produced by ultrasound are preferred over aerosol mists produced by other methods because

a smaller particle size of the aerosol can be obtained with the ultrasonic waves. One of the major shortcomings of inhalers and nebulizers is that the aerosol mist cannot be directed to a target area without an air stream which decreases the efficiency of ultrasound.

Ultrasonic sprayers such as those sold by Sonic and Materials Inc., Misonix Inc., Sono-Tek Inc., and Zevex International, Inc. (see, for example, U.S. Patents: 2,765,606, 4,659,014, 5,104,042, 4,930,700, 4,153,201, 4,655,393, 5,516,043, 5,835,678, 5,879,364, and 5,843,139) operate by passing liquid through a central orifice of an ultrasound instrument-tip. These ultrasonic devices do not have and do not need any removable nozzles to create a liquid spray.

Ultrasonic inhalers and drug delivery systems from Medisonic USA, Inc., 3M, Siemens Gmb, The Procter & Gamble Company, Sheffield Pharmaceuticals, and Aradigm, Inc. (see, for example, U.S. Patents 4,294,407, 5,347,998, 5,520,166, 5,960,792, 6,095,141, 6,102,298, 6,098,620, 6,026,808, and 6,106,547) operate by atomizing liquid using piezoceramic film. Although some inhalers and delivery systems use nozzles, the nozzles are just for directing the atomized liquid to the mouth by touching the lips. These nozzles do not create any spray, and the inhaler and drug delivery systems can work without them.

OBJECTS OF THE INVENTION

It is an object of this invention to provide an improved device for treating wounds.

It is also an object of this invention to provide an improved device for treating wounds using ultrasonic waves.

It is a further object of the invention to provide a device for creating, directing and delivering liquid aerosol spray to a wound surface.

It is yet a further object of the invention to provide a device for creating ultrasonic waves and delivering drugs, killing bacteria, cleansing a surface, and/or stimulating healthy tissue.

These and other objects of the invention will become more apparent from the more detailed discussion below.

SUMMARY OF THE INVENTION

The present invention relates to a device using ultrasonic waves to create, direct and deliver liquid aerosol spray to a wound surface. More particularly, the present invention relates to an emission device comprising a nozzle which is a preferably cylindrical, but optionally can be multiangular, from the inside and is cylindrical, rectangular or multiangular from the outside distal end; a liquid reservoir; and a different shaped proximal end to be removably attached to ultrasound transducer.

The liquid reservoir is provided with a valve, which works as a dispenser and allows liquid to reach the ultrasound tip as drops or via continuous flow through an orifice and a gap.

The proximal end of the nozzle can be connected to the transducer housing in a variety of different ways, such as by threads, bolts or screwed on, snap/friction fit, or by other means.

The liquid reservoir portion of the nozzle can be attached to the top, side, or bottom of the nozzle body or located outside the nozzle body. Liquid from the reservoir may be delivered under gravity, or by motorized pump. The liquid reservoir can be elastic or rigid, with or without a cover, and can be made from a variety of different materials, such as, for example, metal, plastic, rubber, ceramic, or other suitable material, and is provided with metered dose device or a liquid dispenser.

The liquid reservoir can provide the free end of an ultrasound transducer tip with liquid/solution directly from inside the distal end of the nozzle, or through an orifice or a tube from the front end of the nozzle.

The nozzle can be provided with two, three or more reservoirs or tubes, for mixing different liquids, drugs or liquid(s) with gas. For example, saline can be mixed with oxygen and used to treat a wound. Gas and liquid can be delivered separately from the top, side and bottom of the distal end of the ultrasound transducer to be mixed and sprayed on the wound surface.

The valve part of the nozzle can be located between the reservoir and nozzle body, inside of the reservoir, or inside of the nozzle. The nozzle can optionally be provided with a trigger connecting and operating the valve. This design allows a user to operate the device with one hand. The trigger can be located on the top, side or bottom of the nozzle.

The nozzle can work without a valve, if, for example, the reservoir is made from an elastic rubber material. In this case liquid from the reservoir is delivered by squeezing the elastic reservoir.

The main body and distal end of the nozzle may be cylindrical, oval, elliptic, conical, rectangular or multiangular from the inside.

From the outside, the main body and distal end of the nozzle can be any shape such as, for example, a cylinder, cut cylinder, cone, cut cone, concave, double cut, rectangular, multiangular or a combination of these shapes.

The proximal end of the nozzle can be any shape, but must be removably attachable to the ultrasound transducer, for example, via threads, friction fit, screws, slots, spline, or other means.

The shape of the distal end of the nozzle as viewed from the horizontal side can be cylindrical, a cut cylinder, conical, a double cut cylinder or cone, spherical, elliptic/oval or curved, multiangular, waved or a combination of these shapes.

Finally the ultrasound wound treatment nozzle can be comprised of many different parts, such as a body/housing, reservoir, valve, and dispenser, or formed in one solid part.

While the invention has been described in general terms, the construction and obvious advantages of the device will be more clearly understood with reference to the following description of the various specific embodiments when read in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a cross-sectional view of a side elevation of a preferred embodiment of the nozzle and fluid reservoir for ultrasound wound treatment according to the invention.

Fig. 2 a) is a cross-sectional view of the nozzle of Fig. 1 with the liquid reservoir located in the preferred top position.

Fig. 2 b) is a cross-sectional end view of the nozzle of Fig. 1 with the liquid reservoir located in the side position.

Fig. 2 c) is another cross-sectional view of the nozzle of Fig. 1 with the liquid reservoir located in the bottom position.

Fig. 2 d) is another cross-sectional view of the nozzle of Fig. 1 with the liquid reservoir located to one side of the preferred top position.

Fig. 3 a) is a cross-sectional elevation view of the nozzle of Fig. 1 with the reservoir providing the tip of the nozzle with liquid directly from inside.

Fig. 3 b) is another cross-sectional elevation view of the nozzle of Fig. 1 with the reservoir providing the tip of the nozzle with liquid through an orifice or tube from the front end of the nozzle.

Fig. 4 a) is a cross-sectional view of the nozzle of Fig. 1 showing the nozzle with multiple liquid entry points.

Fig. 4 b) is top plan view of the nozzle according to the invention showing three liquid/fluid reservoirs located side by side.

Fig. 4 c) is a cross-sectional end elevation view of the nozzle depicted in Figs. 4a and 4b showing the three reservoirs located side by side with three separate entry points located at different points around the nozzle.

Fig. 5 a) is a cross-sectional elevation view of the nozzle of Fig. 1 showing the control valve located within the housing of the liquid reservoirs.

Fig. 5 b) is a cross-sectional elevation view of the nozzle of Fig. 1 showing the control valve located outside the body of the liquid reservoir, but within the body housing of the nozzle.

Fig. 5 c) is a cross-sectional elevation view of the nozzle of Fig. 1 showing the control valve located at various points along the transfer tube.

Fig. 6 is a cross-sectional elevation view of the nozzle of Fig. 1 showing the liquid reservoir in the bottom position without a control valve, where the fluid is delivered via squeezing on a flexible liquid reservoir.

Fig. 7 is a cross-sectional side elevation view of the nozzle of Fig. 1 with the fluid reservoir in the top position employing a trigger to open/close the control valve.

Fig 8 a) is a cross-sectional elevation of the nozzle of Fig. 1 showing the distal end of the nozzle with a cylindrical shape.

Fig. 8 b) is a cross-sectional elevation of the nozzle of Fig. 1 showing the distal end of the nozzle with an oval shape.

Fig. 8 c) is a cross-sectional elevation of the nozzle of Fig. 1 showing the distal end of the nozzle with a conical shape.

Fig. 8 d) is a cross-sectional end view of the nozzle of Fig. 1 showing the distal end with a rectangular section.

Fig. 8 e) is a cross-sectional end view of the nozzle of Fig. 1 showing the distal end of the nozzle with a multiangular section.

Fig. 8 f) is a cross-sectional end view of the nozzle of Fig. 1 showing the distal end of the nozzle with an oval section.

Fig. 9 a) is a cross-sectional elevation view of the nozzle of Fig. 1 showing the outside shape of the nozzle as a cylinder.

Fig. 9 b) is a cross-sectional elevation view of the nozzle of the invention showing the outside of the nozzle as a flared cylinder.

Fig. 9 c) is a cross-sectional elevation view of the nozzle of the invention showing the outside of the nozzle having a conical distal end.

Fig. 9 d) is a cross-sectional elevation view of the nozzle of the invention showing the outside of the nozzle with a concave distal end.

Fig. 9 e) is a cross-sectional elevation view of the nozzle of the invention showing the outside of the nozzle with a double cut profile.

Fig. 9 f) is a cross-sectional elevation view of the nozzle of the invention showing the outside of the nozzle with an oval profile.

Fig. 10 a) is a cross-sectional elevation view of the nozzle of Fig. 1 showing the distal end of the nozzle with a rectangular cut shape.

Fig. 10 b) is a cross-sectional elevation view of the nozzle of Fig. 1 showing the distal end of the nozzle with a cylindrical cut shape.

Fig. 10 c) is a cross-sectional elevation view of the nozzle of Fig. 1 showing the distal end of the nozzle with a conical cut shape.

Fig. 10 d) is a cross-sectional elevation view of the nozzle of Fig. 1 showing the distal end of the nozzle with a spherical elliptical oval cut shape.

Fig. 10 e) is a cross-sectional elevation view of the nozzle of Fig. 1 showing the distal end of the nozzle with a concave cut shape.

Fig. 10 f) is a cross-sectional elevation view of the nozzle of Fig. 1 showing the distal end of the nozzle with a convex shape.

Fig. 10 g) is a cross-sectional elevation view of the nozzle of Fig. 1 showing the distal end of the nozzle with a double cut shape.

Fig. 10 h) is a cross-sectional elevation view of the nozzle of Fig. 1 showing the distal end of the nozzle with a waved cut shape.

Fig. 11 is a cross-sectional elevation view of one preferred embodiment of a self destructing disposable nozzle according to the invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The present invention is a device which uses ultrasonic waves to create, direct and deliver liquid spray to a wound surface comprising a nozzle. The nozzle for ultrasound wound treatment includes a nozzle body having a proximal end which can be removably attached to an ultrasound transducer, the distal end of said nozzle body to be adjacent to the ultrasound transducer tip. The nozzle comprises a generally cylindrical main body and a

reservoir in which wound treatment liquid/solution is filled and a valve for dispensing and delivering the liquid/solution to the distal end of ultrasound tip.

The invention can perhaps be better appreciated from the drawings. A nozzle for ultrasound wound treatment according to the present invention is illustrated in Fig. 1. More particularly, Fig. 1 depicts a cross-sectional view of a side elevation of a preferred embodiment of the nozzle for ultrasound wound treatment, with a main body 10 of the nozzle, a wound treatment liquid/solution reservoir 12, and a retaining wound treatment liquid/solution 14 which is inter-connected via a tube 16, controlled by a valve 18 to deliver a supply of treatment liquid/solution droplets 24 to the distal end of an ultrasound tip 20 of an ultrasound transducer 22. Wound treatment liquid 14 from reservoir 12 is dispensed and delivered by valve 18 to contact distal end of ultrasound tip 20 and spray onto the wound surface.

Figs. 2 a) -d) illustrate possible locations of liquid reservoir 12 relative to nozzle body 10. The preferred location of reservoir 12 is on the top of nozzle body 10, as illustrated in Fig. 2 a), since this arrangement is most convenient, easy to handle and space-saving. Reservoir 12 may optionally be provided with a cover.

Figs. 3 a) and b) depict alternative cross-sectional views of nozzle body 10 and reservoir 12, providing ultrasound tip 20 with liquid/solution directly and through orifice tube 16.

Figs. 4 a) - c), collectively depict side and end elevation views and top views of a three reservoir system for mixing different liquids, drugs, or liquids and gases, for example, saline with oxygen, and treating a wound. Shown are nozzle body 10 and multiple liquid/fluid reservoirs 12, with liquid/fluid treatments 14 being fed via tubes 16 and controlled by valves 18.

Gas and liquid can be delivered separately from the top, side and bottom of the distal end of the ultrasound transducer to be mixed and sprayed on the wound surface. This design allows one to mix different liquids and/or liquids with gas, such as saline or an antibiotic

with oxygen during wound treatment, without the use of high pressure, which is required with other mixing methods.

Figs. 5 a) -c), collectively depict various locations for the placement of valve 18 between reservoir 12 and tube 16 which delivers liquid/fluid to the distal end of ultrasound transducer tip 20.

To avoid liquid loss during dispensing, the distance from valve 18 to the distal end of ultrasound transducer tip 20 should be minimized. This means that valve 18 should be located as close as possible to the distal end of the ultrasound transducer tip 20. For this reason, the most preferred location is as shown in Fig. 5 b).

Fig. 6 depicts a cross-sectional elevation view of another preferred embodiment of the nozzle of the invention without valve 18. In this configuration reservoir 12 must be constructed of an elastic material and liquid 14 will be delivered to the ultrasound transducer tip 20 by squeezing the walls of reservoir 12. Reservoir 12 can be rigid, but liquid must the reach the ultrasound tip 20 using a different means.

Fig. 7 depicts a cross-sectional elevation view of nozzle body 10 with a trigger 26, which is connected and operates valve 18, thus dispensing and changing liquid flow.

Figs. 8 a) - f), collectively depict various alternative preferred nozzle 10 geometries. The shape of the distal end of nozzle 10 from inside can be cylindrical, as shown in Fig. 8 a), conical, as shown in Figs. 8 b) and c), (back or forward), rectangular, as shown in Fig. 8 d), multiangular, as shown in Fig. 8 e), elliptic-oval as shown in Fig. 8 f), or a combination of different shapes. The most preferred shape is cylindrical because of the uniform gap created between distal end of nozzle 10 and cylindrical ultrasound tip 20, with this shape.

Figs. 9 a) - f), collectively depict various alternative preferred nozzle 10 geometries from the outside. The shape of the distal end of nozzle 10 from outside can be cylindrical, as shown in Fig 9 a), conical as depicted in Figs. 9 b)-c), rectangular as shown in Fig. 9), multiangular as shown in Fig. 9 e), elliptic/oval as shown in Fig. 9 f) or a combination of different shapes.

Figs. 10 a) - h) depict cross-sectional elevational views of the distal end of nozzle showing the different shapes possible, a rectangle as shown in Fig. 10 a), cut cylinder as shown in Figs. 10 b) - c), spherical/elliptic/oval as shown in Fig. 10 d), concave as shown in Fig. 10 e), convex as shown in Fig. 10 f), double cut as shown in Fig. 10 g), waved as shown in Fig. 10 h) or a combination of different shapes.

With reference to Fig. 11, shown is one preferred embodiment of a self-destructing disposable nozzle fabricated from one-piece plastic. A trigger 30 with a needle valve 32 connected with reservoir 12 at a point 34 in closing position. After reservoir 12 is filled with liquid and positioning at the wound, trigger 30 is depressed opening valve 32 by lifting. Because of the rigid connection of trigger 30 to reservoir 12, after pushing trigger 30 gets broken at point 34, and after the first procedure is done, will no longer retain the liquid in reservoir 12. Thus, this becomes a one use disposable reservoir/nozzle arrangement.

The preceding specific embodiments are illustrative of the practice of the invention. It is to be understood, however, that other expedients known to those skilled in the art or disclosed herein, may be employed without departing from the spirit of the invention or the scope of the appended claims.

What is claimed is:

1. A nozzle for ultrasound wound treatment, for producing a spray of liquid using an ultrasound transducer tip, directing and delivering said spray onto the wound surface, comprising:

a main body having a proximal end that removably attaches to an ultrasound transducer,

said main body also having a distal end which is marginally close to the free distal end of ultrasound transducer tip,

said distal end of said main body having a gap with said distal end of said ultrasound transducer tip,

said distal end of main body being coaxially placed about the said ultrasound transducer tip,

said main body being connected with at least one reservoir, for holding and delivering a wound treatment solution to the distal end or the marginally close radial side of said ultrasound transducer tip.

2. A nozzle according to Claim 1, wherein said main body is connected with two or more reservoirs, holding and delivering different wound treatment solutions separately to the distal end or marginally close radial side of said ultrasound transducer tip to be mixed and sprayed onto the wound.

3. A nozzle according to Claim 1, wherein said main body is connected with at least one reservoir and at least one gas tube, for delivering different wound treatment solutions and gas separately to the distal end or marginally close radial side of said ultrasound transducer tip to be mixed and sprayed onto the wound.

4. A nozzle for ultrasound wound treatment according to Claim 1 for producing a spray of liquid using an ultrasonic transducer tip, directing and delivering said spray onto said wound surface, further comprising valve for controlling flow rate.

5. A nozzle according to Claim 4, wherein said main body has a trigger for controlling the position of said valve.

6. A nozzle according to Claim 1, wherein a distal end of nozzle from inside is cylindrical.

7. A nozzle according to Claim 1, wherein a distal end of nozzle from inside is cone.

8. A nozzle according to Claim 1, wherein the distal end of the nozzle from the inside is oval.

9. A nozzle according to Claim 1, wherein the distal end of the nozzle from the inside is elliptic.

10. A nozzle according to Claim 1, wherein the distal end of the nozzle from the inside is rectangular.

11. A nozzle according to Claim 1, wherein the distal end of the nozzle from the inside is multiangular.

12. A nozzle according to Claim 1, wherein the distal end of the nozzle from the inside is threaded.

13. A nozzle according to Claim 1, wherein the distal end of the nozzle from the inside is combination of different form.

14. A nozzle according to Claim 1, wherein the distal end of the nozzle from the outside is cylindrical.

15. A nozzle according to Claim 1, wherein the distal end of the nozzle from the outside is cone.

16. A nozzle according to Claim 1, wherein the distal end of the nozzle from the outside is oval.

17. A nozzle according to Claim 1, wherein the distal end of the nozzle from the outside is elliptic.

18. A nozzle according to Claim 1, wherein the distal end of the nozzle from the outside is rectangular.

19. A nozzle according to Claim 1, wherein the distal end of the nozzle from the outside is mutiangular.

20. A nozzle according to Claim 1, wherein the distal end of the nozzle from outside is a combination of different forms.

21. A nozzle according to Claim 1, wherein the main body of the nozzle has a reservoir on the top.

22. A nozzle according to Claim 1, wherein the main body of the nozzle has a reservoir on the bottom.

23. A nozzle according to Claim 1, wherein the main body of the nozzle has a reservoir on the side.

24. A nozzle according to Claim 1, wherein the main body of the nozzle is connected with the said reservoir via hose/tube.

25. A nozzle according to Claim 1, wherein the main body of the nozzle has a rigidly connected reservoir.

26. A nozzle according to Claim 1, wherein the main body of the nozzle has an elastic reservoir.

27. A nozzle according to Claim 2, wherein a valve is located in main body of the said nozzle.

28. A nozzle according to Claim 2, wherein a valve is located in the said reservoir.

29. A nozzle according to Claim 2, wherein a valve is located between the said reservoir and said main body of the nozzle.

30. A nozzle according to Claim 1, wherein said nozzle has no valve and liquid is delivered from said reservoir to the distal end of ultrasound transducer tip via a pump or mechanical squeezing.

31. A nozzle according to Claim 1, wherein said nozzle is made from distinct pieces

32. A nozzle according to Claim 1, wherein said nozzle is made from one piece.

33. A nozzle according to Claim 1, wherein the shape of the distal end of the said main body is a rectangle.

34. A nozzle according to Claim 1, wherein the shape of the distal end of the said main body is a cut.

35. A nozzle according to Claim 1, wherein the shape of the distal end of the said main body is a double cut.

36. A nozzle according to Claim 1, wherein the shape of the distal end of the said main body is a spherical/elliptic/oval.

37. A nozzle according to Claim 1, wherein the shape of the distal end of the said main body is waved.

38. A nozzle according to Claim 1, wherein the shape of the distal end of the said main body is a combination of different form.

39. A nozzle according to Claim 1, wherein the nozzle is self destructing with the first use.

40. A nozzle according to Claim 1, wherein the nozzle is sterile.

41. A nozzle according to Claim 1, wherein the nozzle is sterilizable.

42. A nozzle according to Claim 1, wherein the nozzle is disposable.

43. A nozzle according to Claim 1, wherein a part of nozzle is disposable.

ABSTRACT OF THE DISCLOSURE

A nozzle for ultrasound wound treatment comprising a main body with proximal and distal ends, a reservoir and valve. The proximal end of the nozzle being removably attached to an ultrasound transducer. The distal end of the nozzle being marginally close and coaxial to the free distal end of the ultrasound transducer. The body of the nozzle connected with liquid reservoir, which holds the wound treatment solution and delivers same to the free end of ultrasound tip directly or through a tube. The nozzle is provided with valve for controlling flow rate of wound treatment solution. The nozzle can mix different liquids or a liquid with a gas and deliver same to the wound surface.

The nozzle can also be provided with trigger system for one hand use. The present invention is a device, using ultrasonic waves to create, direct and deliver liquid treatment spray to a wound surface.

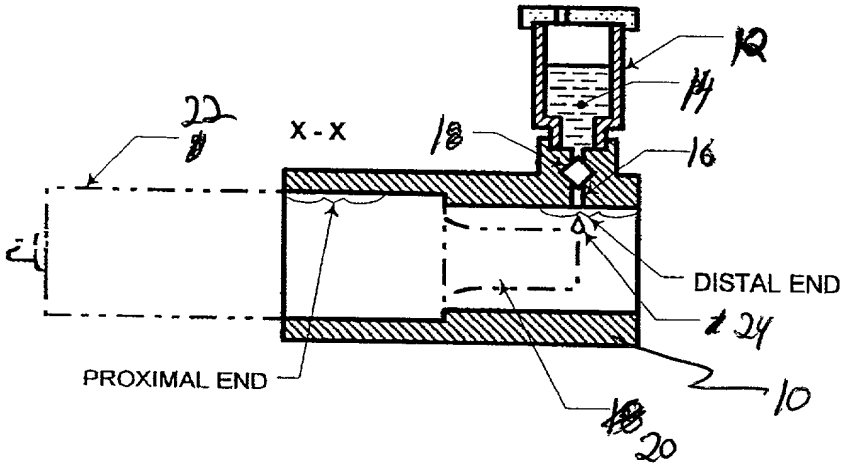


Fig. 1

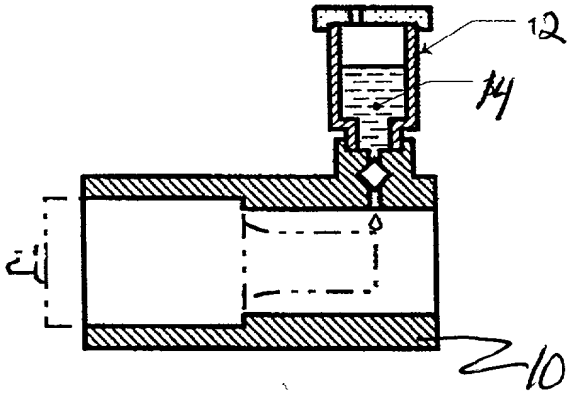


Fig 2a)

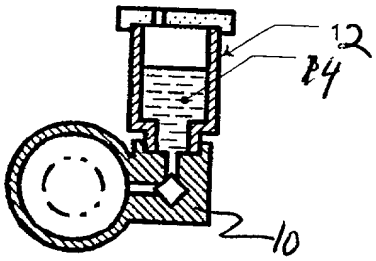


Fig 2b)

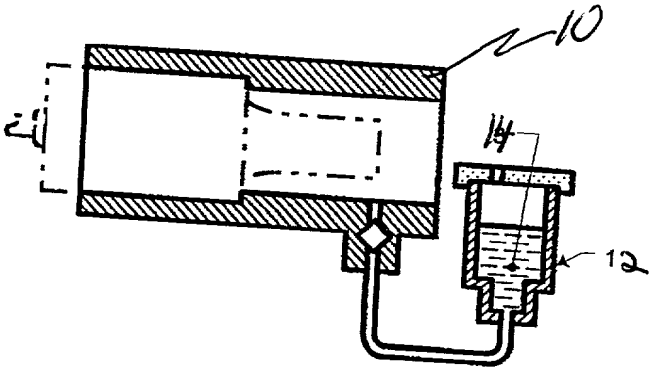


Fig 2c)

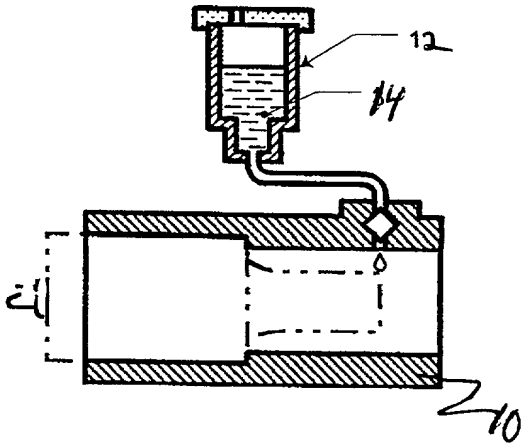
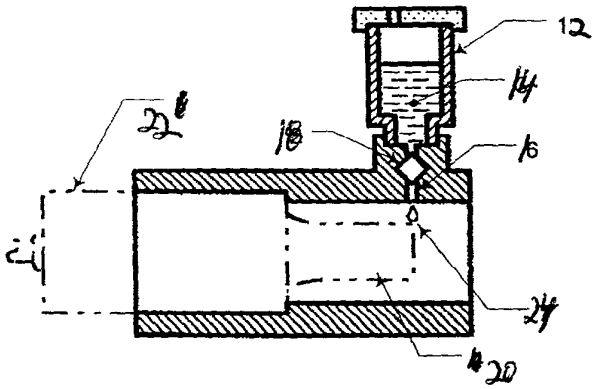


Fig 2d)



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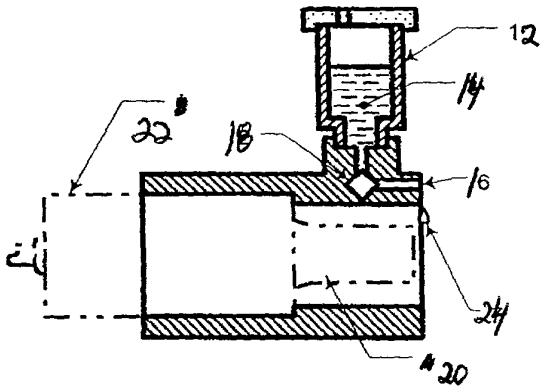


Fig 3 b)

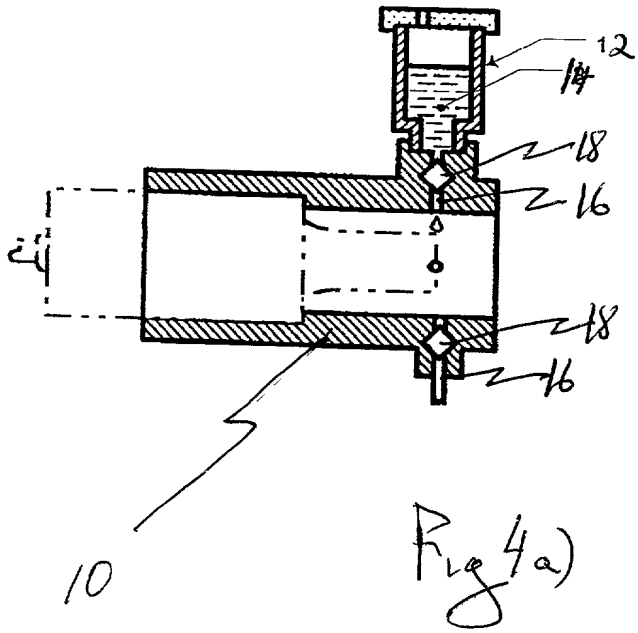


Fig 4a)

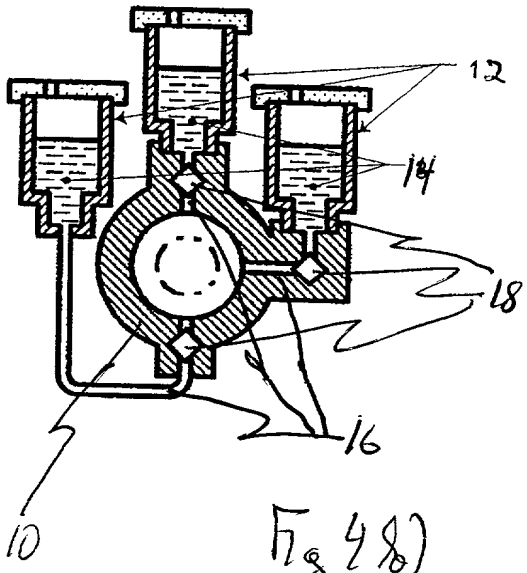


Fig 4b)

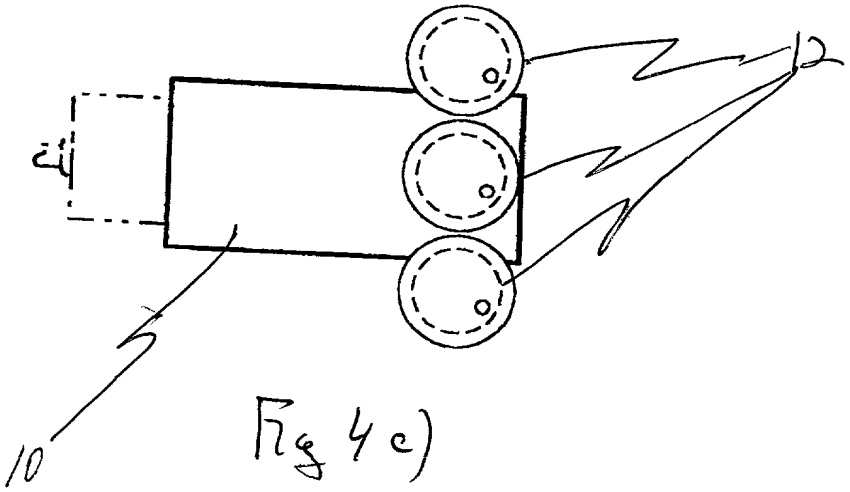
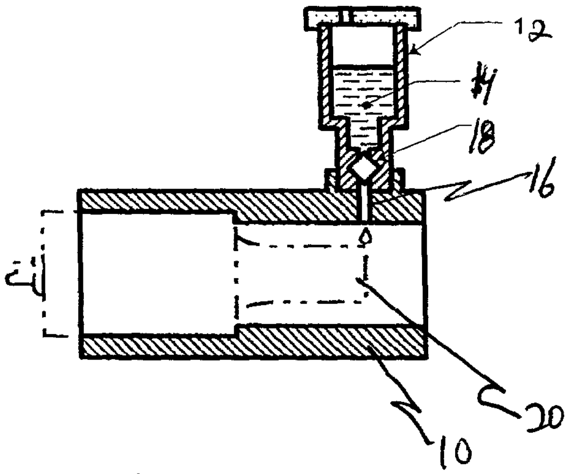


Fig 4c)



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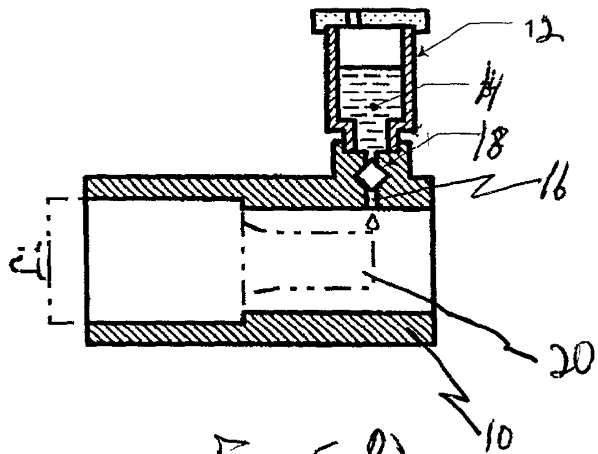


Fig 5b)

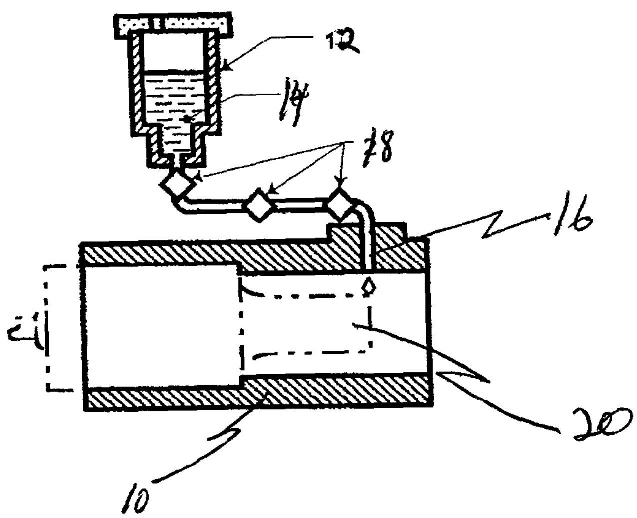


Fig 5c)

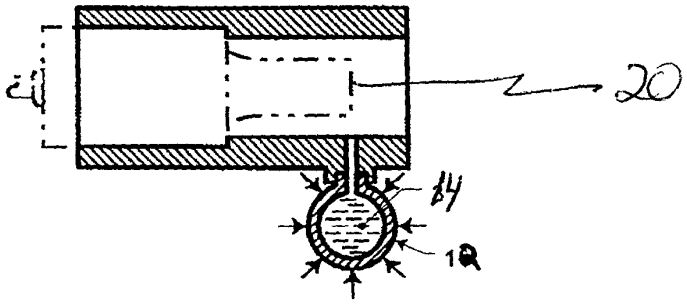


Fig 6

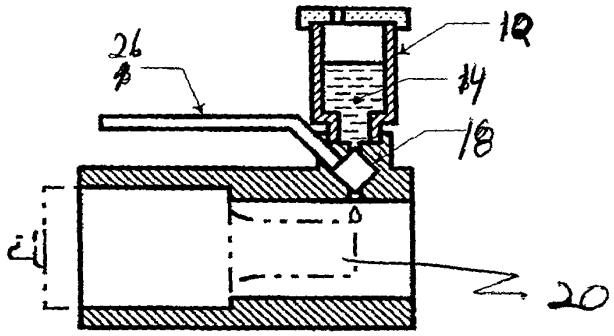


Fig 7

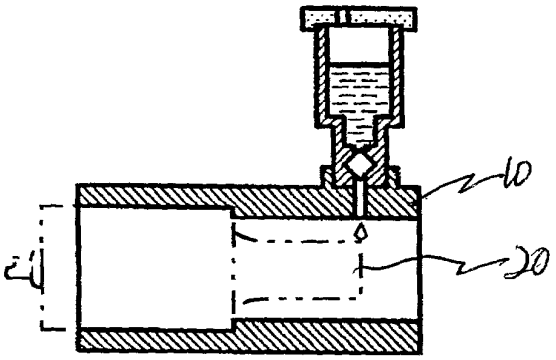


Fig 8 a)

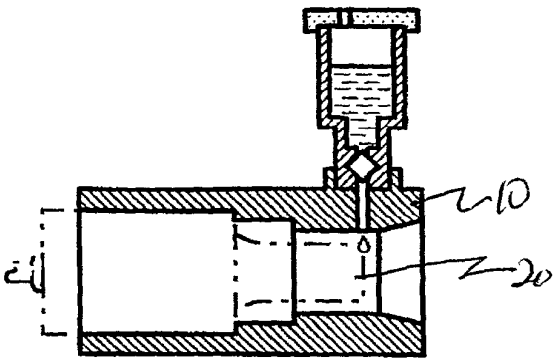


Fig 8 b)

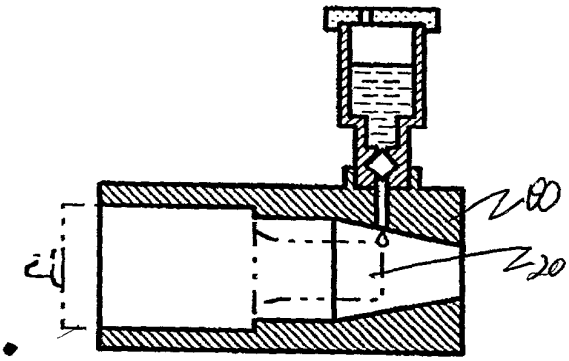


Fig 8 c)

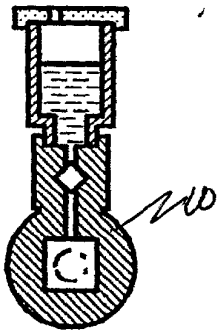


Fig 8 d)

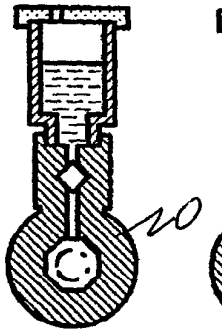


Fig 8 e)

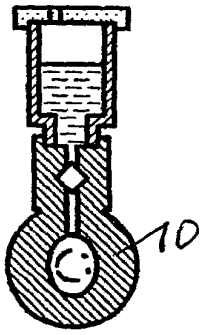


Fig 8 f)

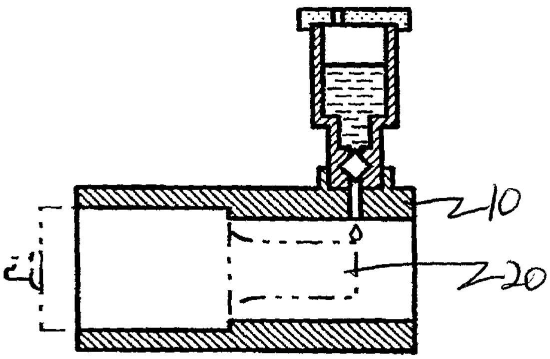


Fig 9a)

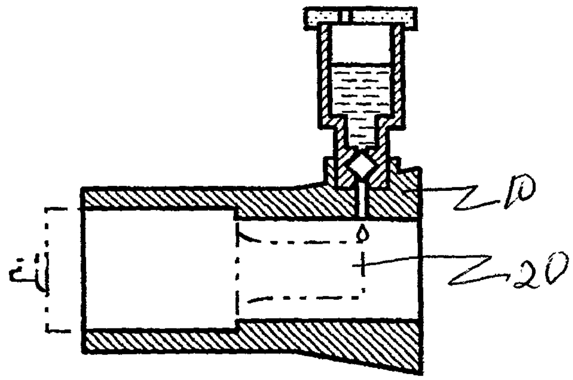


Fig 9b)

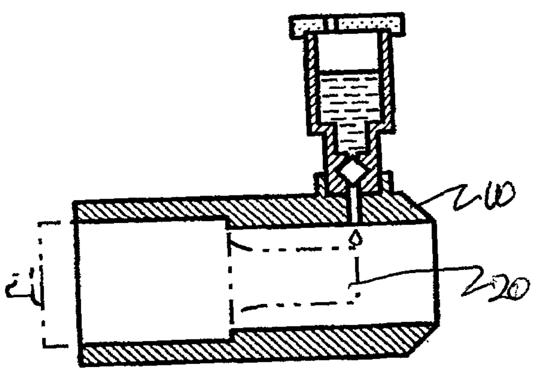


Fig 9c)

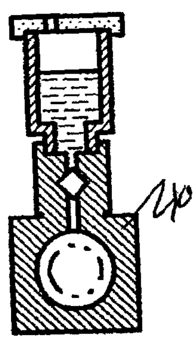
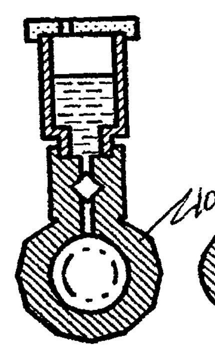


Fig 9d)



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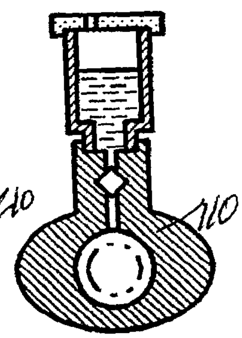

Fig 9f)

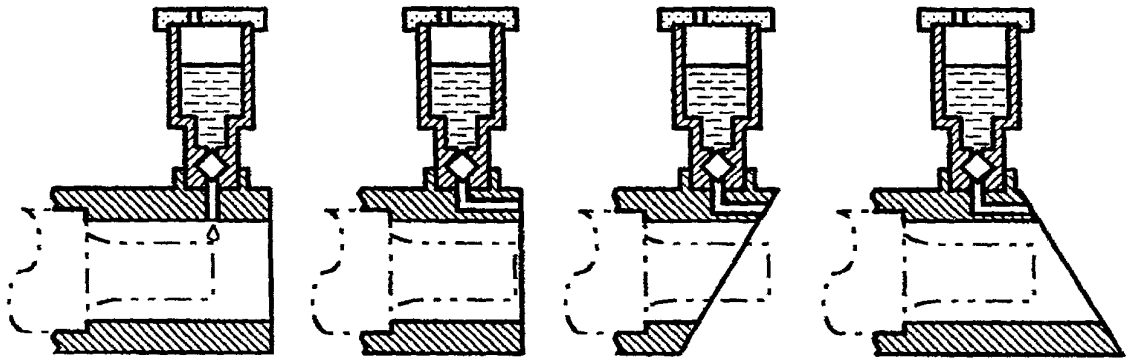

Fig 10a) Fig 10b) Fig 10c) Fig 10d)

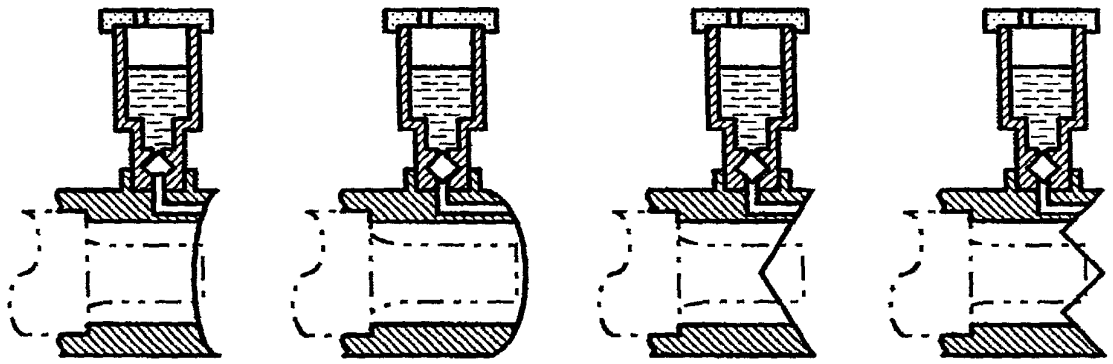

Fig 10e) Fig 10f) Fig 10g) Fig 10h)

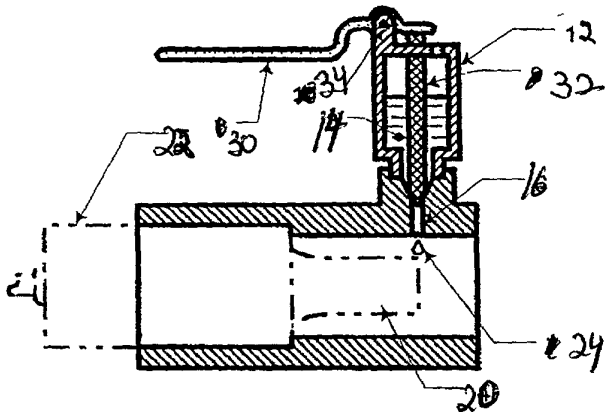

Fig. 11

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DECLARATION FOR UTILITY OR DESIGN PATENT APPLICATION (37 CFR 1.63)

☒ Declaration Submitted with Initial Filing OR ☐ Declaration Submitted after Initial Filing (surcharge (37 CFR 1.16 (e)) required)

Attorney Docket Number	24149-11
First Named Inventor	Eilaz Babaev
COMPLETE IF KNOWN	
Application Number	/ to be assigned
Filing Date	to be assigned
Group Art Unit	
Examiner Name	

As a below named *inventor, I hereby declare that:*

My residence, post office address, and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

NOZZLE FOR ULTRASOUND WOUND TREATMENT

(Title of the invention)

the specification of which
☒ is attached hereto
OR
☐ was filed on (MM/DD/YYYY) [ ] as United States Application Number or PCT International Application Number [ ] and was amended on (MM/DD/YYYY) [ ] *(if applicable).*

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment specifically referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in 37 CFR 1.56.

I hereby claim foreign priority benefits under 35 U.S.C. 119(a)-(d) or 365(b) of any foreign application(s) for patent or inventor's certificate, or 365(a) of any PCT international application which designated at least one country other than the United States of America, listed below and have also identified below, by checking the box, any foreign application for patent or inventor's certificate, or of any PCT international application having a filing date before that of the application on which priority is claimed.

Prior Foreign Application Number(s)	Country	Foreign Filing Date (MM/DD/YYYY)	Priority Not Claimed	Certified Copy Attached? YES	NO
			☐	☐	☐
			☐	☐	☐
			☐	☐	☐
			☐	☐	☐

☐ *Additional foreign application numbers are listed on a supplemental priority data sheet PTO/SB/02B attached hereto:*

I hereby claim the benefit under 35 U.S.C. 119(e) of any United States provisional application(s) listed below.

Application Number(s)	Filing Date (MM/DD/YYYY)

☐ Additional provisional application numbers are listed on a *supplemental priority data sheet* PTO/SB/02B attached hereto.

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DECLARATION — Utility or Design Patent Application

I hereby claim the benefit under 35 U.S.C. 120 of any United States application(s), or 365(c) of any PCT international application designating the United States of America, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT international application in the manner provided by the first paragraph of 35 U.S.C. 112, I acknowledge the duty to disclose information which is material to patentability as defined in 37 CFR 1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application.

U.S. Parent Application or PCT Parent Number	Parent Filing Date (MM/DD/YYYY)	Parent Patent Number (If applicable)

☐ Additional U.S. or PCT international application numbers are listed on a supplemental priority data sheet PTO/SB/02B attached hereto.

As a named inventor, I hereby appoint the following registered practitioner(s) to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith. ☐ Customer Number OR ☒ Registered practitioner(s) name/registration number listed below → Place Customer Number Bar Code Label here

Name	Registration Number	Name	Registration Number
Michael I. Wolfson	24,750	Mark Montague	36,612
William H. Dippert	26,723		
R. Lewis Gable	22,479		

☐ Additional registered practitioner(s) named on supplemental Registered Practitioner Information sheet PTO/SB/02C attached hereto.

Direct all correspondence to: ☐ Customer Number or Bar Code Label [ ] OR ☒ Correspondence address below

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City	New York	State	NY	ZIP	10036-6799
Country	USA	Telephone	(212) 790-9200	Fax	(212) 575-0671

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. 1001 and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Name of Sole or First Inventor: ☐ A petition has been filed for this unsigned inventor

Given Name (first and middle if any)	Family Name or Surname
Eliaz	Babaev

Inventor's Signature	[signature]					Date	10-6-00
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Post Office Address							
City	Minnetonka	State	MN	ZIP	55343	Country	US

☐ Additional inventors are being named on the ___ supplemental Additional Inventor(s) sheet(s) PTO/SB/02A attached hereto